INTRODUCTION

The purpose of this handbook is to help land development consultants and contractors incorporate urban Best Management Practices (BMPs) for erosion and sedimentation control into project design, planning, and construction.

This compilation of BMPs provides a menu from which project designers and contractors may choose the practices appropriate to specific projects and sites. The selected BMPs, which will contain both temporary and permanent practices as well as structural and vegetative practices will provide the best protection against erosion and discharge of sediments at sites under construction.

There are other practices not detailed in this handbook that may remedy the problems encountered. However, it is the responsibility of the designer and/or contractor to show that the new practice will achieve the desired result of no discharge of sediment. Also creativity is encouraged. Use of some structural practices will require a professional engineer to design them in accordance with 32 MRSA Section 125.

WHAT IS EROSION?

Soil erosion is the detachment of soil particles and loss of soil from an area by the action of water, ice, gravity or wind. While natural erosion has been occurring constantly at a slow rate since the earth was formed, accelerated erosion occurs because of disturbances by people. Water-generated erosion causes the most severe damage to a site undergoing development. The serious consequence of erosion is **sedimentation** - the deposition of eroded soil particles that have been transported by water. When the velocity of flow is insufficient to transport sediment, deposition occurs.

THE IMPACT OF EROSION

As Maine's forested land is converted to commercial, industrial and residential land use, both the volume and quality of surface runoff change. This presents a potential threat to water resources. Large-scale development has a significant potential to impact Maine's water primarily because of the amount of land area exposed to erosive forces. Residential development also impacts water quality with increased volumes of runoff and the changed quality of runoff.

Human, animal and plant life also suffers adverse effects from erosion. As topsoil is lost, the land becomes less able to support vegetation. Our drinking water supplies become polluted because of erosion. Contaminants such as heavy metals or nutrients such as phosphorus attach to soil particles. When soil erodes, these pollutants are picked up and contribute to the so-called "non-point source pollution" of all surface waters.

Erosion also destabilizes stream banks, causing loss of property and recreational areas and altering fragile ecosystems. Sediments suspend in water and cover stream bottoms. These suspended solids screen out sunlight and act as abrasives on fish gills and scales. When a blanket of sediment forms on a naturally porous stream bottom, it becomes clogged, smothering organisms, destroying spawning areas and blocking fish passage.

As roadway shoulders and embankments erode and washouts around pipes and bridge abutments occur, buildings, bridges and guardrails become structurally unstable.

Finally--sedimentation can cause decreased channel capacity of waterways posing flooding problems and ultimately, the added cost of dredging to remove the sediment. Municipalities will suffer higher maintenance costs because of the more frequent need to clean water reservoirs, storm sewers, culverts and ditches.

Although many construction sites may be rapidly stabilized after the completion of construction, the permanent drainage systems and large amounts of impervious area cause long-term impacts because of the increased storm runoff and its potential to erode downstream areas.

Often the environmental impact of erosion is irreparable.

It is often less costly to plan for and prevent erosion than to repair the damage once it has begun. Repair costs are very labor intensive, leading to high expenses for a project.

HOW EROSION OCCURS

In order to prevent erosion, or to control it effectively when it does occur, it is important to understand the four sequential processes involved: raindrop impact, sheet flow, rill/gully formation and stream flow.

Because the problems caused by erosion increase sequentially, it is vital to control erosion at its initial stages.

- **Raindrop** erosion occurs when raindrops fall and their impact dislodges soil particles and splashes them into the air. The dislodged soil particles can then be easily transported great distances by the flow of surface runoff.
- **Sheet** erosion occurs when the action of raindrop splash and runoff remove a layer of exposed surface soil. The water moves as broad sheets over the land and is not confined to small depressions.
- **Rill** and **gully** erosion occurs as runoff flows and concentrates in rivulets cutting several inches deep into the soil surface. These grooves are called rills and when not repaired gullies may develop.
- If rills and gullies are not controlled, **stream** and **channel** erosion result as the increase in the volume and velocity of runoff erode the banks and bottoms of the stream or channel.

FACTORS LINKED TO EROSION

Erosion by rainfall and runoff is related closely to a soil's capacity to transfer water through its ground surface and to how particles in the soil cohere. **Soil properties** involved include: soil texture, percent organic matter, soil structure, soil infiltration capacity and soil permeability. Soils containing high proportions of silt and very fine sand are more erodible than the soils with higher percentage of clay or organic matter. Clay acts as a binder between the soil particles; organic matter maintains a favorable structure, which improves stability and permeability. Well-drained and well-graded gravels and gravel-sand mixtures with little or no silt are the least erodible soils.

Vegetative cover shields the soil surface from the impact of falling rain and slows the velocity of runoff. Plants aid in aerating and absorbing water from the soil, thus maintaining its capacity to retain water. Plant root systems help hold soil particles in place.

Topography and **climate** also affect erosion. The size and shape of a watershed affects the amount and rate of runoff. Slope length and gradient determine the velocity and volume of runoff. The orientation of a slope may affect the vegetative cover. For example, because south-facing slopes tend to be dry, they have less vegetation and hence less erosion protection.

The frequency, intensity and duration of **rainfall** have an effect on soil loss. As both the volume and velocity of rainfall increase, the capacity of runoff to detach and transport soil increases. The seasonal fluctuation of temperatures tends to loosen soil. When precipitation falls as snow no erosion will take place. In the spring, the melting snow adds to the runoff and erosion hazards will be high.